ASSOCIATES INC.

Environmental, Geotechnical and Materials Engineers

GEOTECHNICAL EXPLORATION REPORT

PROPOSED FRESH SAUSAGE BUILDING
HARRISON, OHIO

ATC FILE NUMBER: 72.17489.0049

Prepared for: Bunnel Hill Construction.
c/o: Mr. Robert Heintz
3000-G Henkle Drive
Lebanon, Ohio 45036

Prepared by: ATC Associates Inc.
11121 Canal Road
Cincinnati, Ohio 45241

June 3, 2009

ATC ASSOCIATES INC.
Engineering Individual Solutions

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513-771-2112
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June 3, 2009

Bunnell Hill Construction
c/o Mr. Robert Heintz
3000-G Henkle Drive
Lebanon, Ohio 45036

RE: Geotechnical Exploration Report
Proposed Fresh Sausage Building
Harrison, Ohio
ATC File Number: 72.17489.0049

Gentlemen:

In compliance with your recent request, ATC has completed a subsurface exploration and evaluation for the above referenced project. It is our pleasure to transmit herewith this report of the result of this exploration.

This work was performed in general accordance with ATC's Proposal No. 072-2009-0025, dated April 28, 2009. The work was authorized by the return of a copy of the Client Service Agreement signed by Mr. Robert Heintz. If you should have any questions regarding our report, please contact this office.

Very truly yours,

ATC Associates. Inc.

STATE OF OHIO
ADAM M. COLLINS
70465
REGISTERED
PROFESSIONAL ENGINEER

Adam M. Collins, P.E.
Project Geotechnical Engineer

John A. Kerr, P.E.
Principal Geotechnical Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a geotechnical exploration and subsurface condition evaluation conducted for the proposed Fresh Sausage Building located on the west side of Southwest Parkway in Harrison, Ohio. This work was performed in general accordance with ATC's Proposal No. 072-2009-0025, dated April 28, 2009. The work was authorized by the return of a copy of the Client Service Agreement signed by Mr. Robert Heintz.

The purpose of the exploration was to identify the subsurface profile at the site, to evaluate the suitability of the materials for support of the building foundations, and to develop recommendations relative to the design of the foundations. Comments and recommendations regarding earthwork, site preparation and foundation construction were also developed.

The scope of the exploration included a review of available geologic and subsurface data for the project area, a visual reconnaissance of the project site and surroundings, completion of four (4) soil test borings, field and laboratory soil testing, and an engineering analysis and evaluation of the subsurface conditions encountered at the site.

2.0 PROJECT AND SITE CHARACTERISTICS

It is our understanding that the project will consist of the construction of an approximately 164 by 204 foot industrial building which will have a concrete slab-on-grade floor with no basement. The proposed finished floor elevation is 575.0 feet, which is approximately 4 feet above existing grade. The proposed building will be a relatively high walled, steel framed structure.

Based on information provided by Bunnell Hill Construction, the maximum unfactored column and wall loads are less than 150 kips and 3 kips/linear foot, respectively.

The proposed site is currently an undeveloped vacant lot that slopes down gently to the south. Surface cover at the site consists primarily of grass and weeds.

The Test Boring Location Plan, included in the Appendix, shows the locations of the proposed building and the approximate locations of the borings completed for this study.

3.0 GENERAL SUBSURFACE CONDITIONS

Four (4) soil test borings were completed as part of this exploration. A truck-mounted rotary drilling rig equipped with hollow stem augers was used to drill the borings. Subsurface material samples were recovered and returned to ATC's Cincinnati, Ohio, laboratory for analysis, testing and evaluation. ATC's engineering staff classified all samples by visual/manual methods.

The stratification lines shown on the test boring logs represent the approximate depth of the transitions between material types. In-situ strata changes may be more gradual, and may occur at different depths from those indicated on the logs. The test borings also note subsurface conditions at the specific locations and times indicated on the logs. Some conditions, particularly groundwater levels, could change with time, and may be different at the time of construction. Variations in subsurface conditions may also be present between boring positions.

The subsurface profiles and groundwater conditions at each of the boring positions are detailed on the boring logs included in the Appendix of this report, but in general terms consist of the following.

3.1 Subsurface Profile

Topsoil was generally present at the ground surface throughout the site; the test borings encountered approximately 1 inch of topsoil at the ground surface.

Beneath the topsoil, naturally occurring soils were encountered in the soil test borings. In general, the subsurface profile consists of three distinct strata. These strata are described in detail in the following paragraphs.

Stratum I – Very Sandy Cohesive Soils: Very sandy cohesive soils were encountered to a depth of approximately 3½ feet below ground surface (bgs). According to the Unified Soil Classification System (USCS), the Stratum I soils were classified as sandy lean clay (CL) or lean clay with sand (CL). In general, the Stratum I soils were described as brown. Standard penetration test (SPT) N-values in the Stratum I soils ranged from 5 to 10 blows per foot (bpf), indicating a soft to medium stiff consistency. The natural moisture contents of the Stratum I soils ranged from about 14 to 16 percent. The Liquid Limit of a representative sample of the Stratum I soil was 31, and the Plasticity Index was 15.

Stratum II – Loose Granular soils: Stratum II soils were encountered beneath the Stratum I soils in test borings B-1, B-2 and B-3 to an approximate depth of 8½ feet bgs. According to the USCS, the Stratum II soils were classified as clayey sand (SC) or clayey gravel with sand (GC) overlying poorly-graded (fine) sand with gravel (SP) or poorly-graded (fine) gravel with sand (GP). The Stratum II soils were described as brown to dark brown. SPT N-values in the Stratum II soils ranged from 3 to 9 bpf, indicating a very loose to loose consistency. The natural moisture contents of the Stratum II soils ranged from about 7 to 15 percent, with an average moisture content of about 9 percent.

Of special concern are the Stratum II soils encountered in test boring B-3, which had SPT N-values of 3 and 4. ATC is very concerned that these highly compressible soils may be present in other areas throughout the site, undetected by the relatively limited subsurface exploration.

Stratum III – Medium Dense to Dense Granular Soils: Stratum III materials were encountered beneath the Stratum I soils in test boring B-4, and beneath the Stratum II materials in the remaining test borings. The Stratum III soils were encountered to boring termination in each boring at a depth of approximately 25 feet bgs. According to the USCS, the Stratum III soils were classified as well-graded sand with gravel (SW) or poorly-graded (fine) gravel with sand (GP). The Stratum III soils were described as brown to light brown. SPT N-values in the Stratum III soils ranged from 16 to 49 bpf, indicating a medium dense to dense relative density.

3.2 Groundwater Conditions

Groundwater level observations were made both during and on completion of drilling operations, and are noted on the individual test boring logs. Water was not observed in any of the soil test borings. It should be noted that the observed groundwater levels depend on variations in seasonal and short-term precipitation and surface runoff, and may be different at the time of construction.

Test borings B-1 through B-4 caved in at depths ranging from 10 to 11½ feet bgs.

4.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based upon our analysis of the soil conditions and design information supplied for this project by the client as previously outlined, the following conclusions were reached, and the following foundation recommendations were developed. If the project characteristics are changed from those assumed herein, or if different subsurface conditions are encountered during construction, ATC should be notified so that our recommendations can be reviewed to see whether any modifications are needed.

4.1 Foundation Recommendations

It is our opinion that the proposed building may be supported by a system of conventional spread footings. However, due to the presence of the low SPT N-value Stratum II soils, ATC is concerned that unwanted or excessive settlement may occur unless certain procedures are followed. In order to mitigate this settlement, ATC is recommending a relatively low bearing capacity and a detailed foundation subgrade inspection at each foundation element. The detailed foundation inspection should consist of multiple hand augered borings at each footing location to a <u>minimum</u> depth of 5 feet below the bottom of each footing to determine if very loose granular materials are present beneath the footing. If very loose granular materials are encountered, they should be excavated and replaced with properly compacted engineered fill materials or lean concrete.

Because the soils have low strength and/or contain à high granular content, ATC is concerned with excavation sidewall stability. See Section 5.2 for excavation considerations.

Footings bearing on new engineered fill materials or on backfilled lean concrete should be designed for a maximum net allowable bearing pressure of 1,500 pounds per square foot (psf) for both column (square) and wall (continuous) footings.

A coefficient of friction between the base of the footing and the bearing soil of 0.35 may be used when determining the foundation's resistance to horizontal loads. This coefficient should be used in conjunction with the minimum vertical foundation load, and is an ultimate, unfactored value. An appropriate factor of safety should be used when determining the allowable service load capacity of the footing.

To minimize foundation movement due to environmental factors, all exterior footings should bear at a minimum depth of 2.5 feet for this project. Interior footings beneath climate-controlled areas may bear at nominal depths.

In applying "net" allowable soil bearing pressures during footing design, the weight of the footings and backfill over the footings, including the floor slab, need not be included in total loads for dimensioning of footings. Wall footings or related over-excavations should be at least sixteen (16) inches in width, and isolated column footings or related over-excavations should have a minimum width or diameter of 24 inches, regardless of the actual contact pressures developed, to minimize the possibility of "punching" shear failure. The previously stated recommended soil bearing capacity should be treated as an upper limit, and lower values may be utilized for foundation system design if desired.

All foundation bearing surfaces should be protected against freezing, flooding by surface water, and undue disturbance, since the foundation soils will tend to soften and lose strength when subjected to these conditions. All footing excavations and bearing surfaces should be examined by a representative of ATC to verify that conditions are compatible with the design recommendations before placing concrete.

Footing concrete or backfill lean concrete should be placed the same day that footing excavations are completed; if the footing excavations are backfilled with lean concrete, place footing concrete only after the lean concrete has cured sufficiently.

4.2 Floor Slab Recommendations

ATC understands that up to 4 feet of grade-raise fill materials will be required to achieve final grade at the site. Grade-raise fill materials should be placed in accordance with the recommendations presented in Section 5.0 of this report.

A vapor barrier should be placed immediately beneath the slab if protection of tile or similar floor coverings is desired. If curling of the slab edges is of greater concern, the vapor barrier should be placed below the granular base material. The slab should include control joints to preclude random cracking. Particular attention should be paid to the placement of backfill against foundation walls where equipment access is difficult, as inadequate compaction at these locations may cause cracking of the edges and corners of the slab as a result of backfill settlement.

The slab should be designed to be structurally independent of any building footings or walls and should be appropriately reinforced to support the loads proposed.

It is recommended that slab-on-grade floors be supported on a minimum 4-inch thickness of compacted aggregate base material. Assuming that the slab subgrade is prepared in accordance with the recommendations of report Section 5 of this report, a modulus of subgrade reaction (k) of 100 psi/inch may be used for the design of the slabs. For every additional 2 inches of granular base material used beneath the slab, up to a total thickness of 12 inches, the modulus may be increased by 10 psi/inch.

4.3 Pavement Subgrade Preparation Recommendations

As previously mentioned, the surficial soils at this site exhibited low strength characteristics in the form of low SPT N-values. It is ATC's opinion that pavements bearing on these surficial materials would have an increased risk of unwanted distress such as cracking or heaving. To mitigate this risk, ATC recommends that all light-duty pavements at this site be supported by a minimum of 2 feet of properly compacted engineered fill materials placed in accordance with the recommendations presented in Section 5 of this report. Similarly, in heavy-duty pavement areas, ATC recommends a minimum of 3 feet of properly compacted engineered fill materials. If dense-graded granular material such as ODOT 304 Aggregate Base is underlain used, the thickness of the engineered fill can probably be reduced, depending upon the results of the proofrolling prior to filling (see Section 5.1).

4.4 Drainage

Adequate surface water drainage should be provided at the site to minimize the potential for moisture content changes within the foundation and subgrade soils. The ground surface should be sloped away from the building addition to prevent ponding of water adjacent to the building. Site drainage should also be arranged so that runoff onto adjacent properties is properly controlled. Positive drainage of the site should also be maintained throughout the construction period.

5.0 RECOMMENDED EARTHWORK PROCEDURES

It is recommended that the geotechnical engineer be retained by the owner to provide ongoing review of the phases of the project related to subsurface conditions and to correlate the test boring data with the subsurface conditions that are encountered during construction.

5.1 Site Preparation

All vegetation, existing structures, pavement and debris and other man-placed objects should be removed from the proposed building and pavement areas, and all areas to receive grade-raise fill, prior to initiating new construction or grade-raise fill placement.

It is recommended that after stripping a proofroll test be performed on the exposed subgrade using suitable equipment such as a fully loaded tandem-axle dump truck and monitoring the subgrade behavior. As previously mentioned, the near-surface soils at this site are expected to exhibit low-strength characteristics, and are anticipated to be quite prone to pumping and rutting. Any areas showing excessive deflection or substantial yielding under the proofroll loads should be removed and replaced or stabilized as directed by the geotechnical engineer prior to placing any new fill, foundations, floor slabs or pavements.

ATC anticipates that a greater than normal amount of site work will be required to prepare this site for grade-raise fill and slab-on-grade support. The owner and contactor should be prepared for methods such as (in no particular order or preference) chemical modification; soil moisture conditioning and recompaction: geogrid reinforcement, or other stabilization. ATC would be pleased to discuss these methods with Bunnell Hill Construction if they have any questions.

5.2 Excavation

Normal earth excavation equipment should be suitable for the necessary grading and excavation of the overburden soils at this site. Care should be taken to assure that any excessively loose, soft or wet materials are removed from foundation bearing surfaces and areas to receive structural fill.

All temporary excavations for foundations, utilities or other underground structures should be laid back or braced as required by current Occupational Safety and Health Administration (OSHA) requirements. It is our opinion that the majority of the soils encountered within the expected excavation depths at this site should be considered OSHA Type "C" materials, which require excavation sideslopes no steeper than 1.5 horizontal to 1 vertical, and/or shoring and bracing. A "competent person" should review the actual excavation conditions and stability at the time of construction as stipulated by OSHA.

5.3 Fill

As previously mentioned, 0 to 4 feet of grade-raise fill will be required to achieve finished pad/floor and/or pavement elevations. Furthermore, ATC anticipates fill materials will be required to backfill excavations resulting from the removal of soft or loose materials that are unsuitable for support of the proposed construction and grade-raise fill.

ATC recommends that proposed fill materials be approved by the geotechnical engineer prior to delivery to the site. Proposed fill materials should contain no particles larger than 3 inches in maximum dimension, should have a Liquid Limit less than 45 percent, and should contain less than 3 percent by weight of organic matter. Based on the results of our subsurface exploration, it is ATC's opinion that the existing in-situ soils meet these requirements and are considered suitable for re-use as an engineered fill material

Any new fill should be placed in lifts of uniform thickness. The fill should be placed in lifts no thicker than can be properly compacted throughout the entire lift thickness with the available compaction equipment. It is recommended that structural fills supporting floor slabs or pavements be compacted to a minimum of 98 percent of the maximum dry density as determined in accordance with ASTM standard method D 698. For proper and timely construction of the fills, the soils should be placed at or near the optimum moisture content as determined in accordance with ASTM D 698. Suitable equipment for either aerating of wet materials or adding water to dry materials should be available during earthwork operations. If fill construction takes place during the winter months, care should be taken so as not to place fill over frozen soil, and to exclude all frozen materials from fills being placed.

6.0 REVIEW OF PLANS AND CONSTRUCTION

It is recommended that ATC be retained to review final project plans and specifications, and to perform continuous review of the geotechnical and earthwork phases of this project. If ATC is not retained, ATC can assume no responsibility for compliance of the work with the design concepts, specifications, or for modifications or recommendations made during construction. As part of this review, site clearing and stripping, undercutting, fill placement and foundation excavation operations should be monitored and in-place density tests should be performed on fill and backfill as frequently as necessary to allow evaluation of the fill with respect to project earthwork specifications.

7.0 FIELD AND LABORATORY INVESTIGATIONS

7.1 Scope

Field exploration included the performance of soil test borings located approximately as shown on the enclosed Boring Location Plan, and the performance of standard penetration tests on the in-situ soils. Observations regarding groundwater level were made at each boring location. The ground surface elevations at the borings were interpolated from plans provided by the client, and should be considered approximate.

The encountered materials have been visually classified by the ATC engineering staff, and are described in detail on the boring logs. The results of the field penetration tests, strength tests, water level observations, and laboratory moisture content tests are presented on the boring logs. Samples of the soils encountered in the field were placed in sealed sample jars and are now stored in our laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of 30 days from the date of this report.

7.2 Field Exploration

Test borings were performed with a truck-mounted drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Samples of the in-situ soils were obtained employing split-barrel sampling procedures in general accordance with ASTM Standard Method D-1586.

7.3 Laboratory Testing Program

In conjunction with the field exploration, a laboratory testing program was conducted to determine pertinent engineering characteristics of the subsurface materials as necessary for development of engineering recommendations. The laboratory testing program included visual classification of all samples. Calibrated spring penetrometer measurements and natural moisture content tests were conducted for selected soil samples. An Atterberg Limit test and a grain size distribution test were performed on selected samples. All phases of the laboratory testing program were conducted in general accordance with applicable ASTM specifications and procedures. All laboratory test results are included in the appendix.

8.0 LIMITATIONS OF STUDY

8.1 Differing Conditions

Recommendations for this project were developed utilizing soil information obtained from the test borings that were completed at the proposed site. These borings indicate subsurface soil and groundwater conditions at the specific locations and time at which the borings were conducted. Conditions at other locations on the site may differ from those occurring at the boring positions, particularly at previously developed site such as this. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the immediate attention of the geotechnical engineer so that recommendations can be reviewed and revised as required.

8.2 Changes in Plans

The conclusions and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the owner of the proposed project and/or as assumed herein. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary.

8.3 Recommendations vs. Final Design

This report and the recommendations included within are not intended as a final design, but rather as a basis for the final design to be completed by others. It is the client's responsibility to insure that the recommendations of the geotechnical engineer are properly integrated into the design, and that the geotechnical engineer is provided the opportunity for design input and comment after the submittal of this report, as needed. It is strongly recommended that ATC be retained to review the final construction documents to confirm that the proposed project design sufficiently incorporates the geotechnical recommendations. ATC should be represented at pre-bid and/or pre-construction meetings regarding this project to offer any needed clarifications of the geotechnical information to all involved.

8.4 Construction Issues

Although general constructability issues have been considered in this report, the means, methods, techniques, sequences and operations of construction, safety precautions, and all items incidental thereto and consequences of, are the responsibility of the parties to the project other than ATC. This office should be contacted if al guidance is needed in these matters.

8.5 Report Interpretation

ATC is not responsible for conclusions, opinions, or recommendations developed by others on the basis of the data included herein. It is the client's responsibility to seek any guidance and clarifications from the geotechnical engineer needed for proper interpretation of this report.

8.6 Environmental Considerations

The scope of services does not include any environmental assessment investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studies. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client. Unless complete environmental information regarding the site is already available, an environmental assessment is recommended prior to the development of this site.

8.7 Standard of Care

The professional services and engineering recommendations presented in this report have been developed in accordance with generally accepted geotechnical engineering principles and practices in the geographical area of the project at the time of the report. No other warranties, either expressed or implied, are offered.

APPENDIX

Test Boring Location Plan

Logs of Borings (4)

Grain Size Distribution

Field Classification System for Soil Exploration

Unified Soil Classification

Important Information About Your Report

11121 Canal Road
Cincinnati, Ohio 45241
513-771-2112
513-782-6908

TEST BORING LOG

CLIENT: Bunnell Hill Construction
PROJECT NAME: Fresh Sausage Building
PROJECT LOCATION: West Harrison, OH

BORING #: B-1
JOB #: 072.17489.0049
DRAWN BY: AMC
APPROVED BY: JK

DRILLING and SAMPLING INFORMATION

Date Started: 5-6-09
Date Completed: 5-6-09
Drill Foreman: MJ
Inspector:
Boring Method: HSA

Hammer Wt.: 140 lbs.
Hammer Drop: 30 in.
Spoon Sampler OD: 2.25 in.
Rock Core Dia.: in.
Shelby Tube OD: in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test, blows per foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Remarks
Topsoil (1 inch)	0.1												
SOFT, brown, SANDY LEAN CLAY (CL), with root hairs, moist			1	SPT			5		1.5	16			
LOOSE, brown, CLAYEY GRAVEL with SAND (GC), moist	3.5	5	2	SPT			9			15			
LOOSE, brown, POORLY-GRADED SAND with GRAVEL (SP), fine, damp	6.0		3	SPT			7			7			
MEDIUM DENSE, brown, WELL-GRADED SAND with GRAVEL (SW), damp	8.5	10	4	SPT			16						
DENSE, light brown, WELL-GRADED SAND with GRAVEL (SW), damp	13.5	15	5	SPT			26						
		20	6	SPT			39						
			7	SPT			40						
BORING TERMINATED at 25 feet	25.0	25											

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools: dry ft.
At Completion (in augers): ft.
At Completion (open hole): dry ft.
After ______ days ______ ft.
After ______ days ______ ft.
Cave Depth: 10.0 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling

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TEST BORING LOG

CLIENT: Bunnell Hill Construction
BORING #: B-2
PROJECT NAME: Fresh Sausage Building
JOB #: 072.17489.0049
PROJECT LOCATION: West Harrison, OH
DRAWN BY: AMC
APPROVED BY: JK

DRILLING and SAMPLING INFORMATION

Date Started: 5-6-09
Hammer Wt.: 140 lbs.
Date Completed: 5-6-09
Hammer Drop: 30 in.
Drill Foreman: MJ
Spoon Sampler OD: 2.25 in.
Inspector:
Rock Core Dia.: in.
Boring Method: HSA
Shelby Tube OD: in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test, blows per foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Remarks
Topsoil (1 inch)	0.1												
MEDIUM STIFF, brown, LEAN CLAY with SAND (CL), damp	3.5		1	SPT			10		3.5	14	31	15	
LOOSE, dark brown, CLAYEY SAND (SC), damp	6.0	5	2	SPT			7			9			
LOOSE, brown, POORLY-GRADED GRAVEL with SAND (GP), fine, damp	8.5		3	SPT			7			7			
MEDIUM DENSE, brown, WELL-GRADED SAND with GRAVEL (SW), damp	13.5	10	4	SPT		Cave (11.0)	18			4			
MEDIUM DENSE, light brown, WELL-GRADED SAND with GRAVEL (SW), damp		15	5	SPT			47						
		20	6	SPT			30						
	25.0	25	7	SPT			30						
BORING TERMINATED at 25 feet													

Sample Type
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

Depth to Groundwater
- Noted on Drilling Tools dry ft.
- At Completion (in augers) ft.
- At Completion (open hole) dry ft.
- After days ft.
- After days ft.
- Cave Depth 11.0 ft.

Boring Method
- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling

ATC
11121 Canal Road
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TEST BORING LOG

CLIENT: Bunnell Hill Construction
PROJECT NAME: Fresh Sausage Building
PROJECT LOCATION: West Harrison, OH

BORING #: B-3
JOB #: 072.17489.0049
DRAWN BY: AMC
APPROVED BY: JK

DRILLING and SAMPLING INFORMATION

Date Started	5-6-09	Hammer Wt.	140 lbs.
Date Completed	5-6-09	Hammer Drop	30 in.
Drill Foreman	MJ	Spoon Sampler OD	2.25 in.
Inspector		Rock Core Dia.	in.
Boring Method	HSA	Shelby Tube OD	in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test, blows per foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Remarks
Topsoil (1 inch)	0.1												
MEDIUM STIFF, brown, LEAN CLAY with SAND (CL), damp	3.5		1	SPT			8		1.75	15			
VERY LOOSE, dark brown, CLAYEY SAND (SC), damp	6.0	5	2	SPT			3			8			
VERY LOOSE, dark brown, POORLY-GRADED SAND with GRAVEL (SP), fine, damp	8.5		3	SPT			4			7			
MEDIUM DENSE to DENSE, light brown, WELL-GRADED SAND with GRAVEL (SW), damp			4	SPT			25						
		10											
			5	SPT			27						
		15											
			6	SPT			35						
	23.5	20											
MEDIUM DENSE, light brown, POORLY-GRADED SAND (SP), fine, damp	25.0		7	SPT			19						
BORING TERMINATED at 25 feet		25											

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools dry ft.
At Completion (in augers) ft.
At Completion (open hole) dry ft.
After days ft.
After days ft.
Cave Depth 10.0 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling

TEST BORING LOG

11121 Canal Road
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CLIENT	Bunnell Hill Construction	BORING #	B-4
PROJECT NAME	Fresh Sausage Building	JOB #	072.17489.0049
PROJECT LOCATION	West Harrison, OH	DRAWN BY	AMC
		APPROVED BY	JK

DRILLING and SAMPLING INFORMATION

Date Started	5-6-09	Hammer Wt.	140 lbs.
Date Completed	5-6-09	Hammer Drop	30 in.
Drill Foreman	MJ	Spoon Sampler OD	2.25 in.
Inspector		Rock Core Dia.	in.
Boring Method	HSA	Shelby Tube OD	in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test, blows per foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content %	Liquid Limit (LL)	Plasticity Index (PI)	Remarks
Topsoil (1 inch)	0.1												
MEDIUM STIFF, brown, LEAN CLAY with SAND (CL), moist			1	SPT			7						
MEDIUM DENSE, light brown, POORLY-GRADED GRAVEL with SAND (GP), fine, damp	3.5		2	SPT			22			5			
		5	3	SPT			27			4			
			4	SPT			26			4			
		10				Cave							
			5	SPT			21						
		15											
DENSE, light brown, POORLY-GRADED GRAVEL with SAND (GP), fine, damp	18.5		6	SPT			31						
		20											
			7	SPT			49						
BORING TERMINATED at 25 feet	25.0	25											

Sample Type

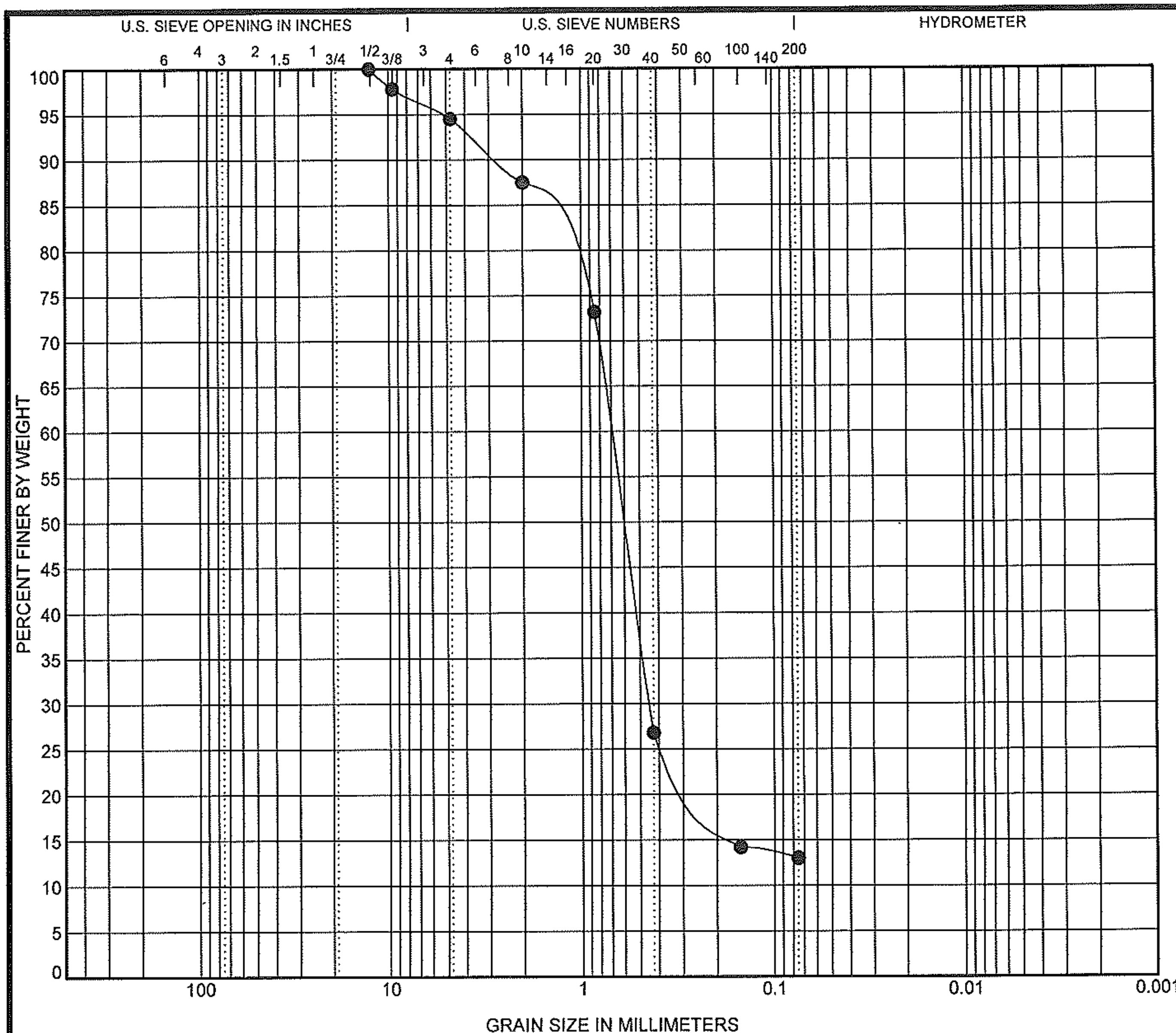
- SS - Driven Split Spoon
- ST - Pressed Shelby Tube
- CA - Continuous Flight Auger
- RC - Rock Core
- CU - Cuttings
- CT - Continuous Tube

Depth to Groundwater

- Noted on Drilling Tools dry ft.
- At Completion (in augers) ft.
- At Completion (open hole) dry ft.
- After days ft.
- After days ft.
- Cave Depth 11.5 ft.

Boring Method

- HSA - Hollow Stem Augers
- CFA - Continuous Flight Augers
- DC - Driving Casing
- MD - Mud Drilling



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B3 S2	3.5						

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B3 S2	3.5	12.7	0.698	0.446		5.5	81.5	13.0	

11121 Canal Road
Cincinnati, Ohio 45241
(513) 771-2112
Fax (513) 782-6908

GRAIN SIZE DISTRIBUTION

Project: Fresh Sausage Building

Location: Harrison, Ohio

Number: 72.17489.0049

US GRAIN SIZE 72.17489.0049.GPJ US LAB.GDT 5/22/09

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

Density

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

Relative Proportions

DESCRIPTIVE TERM	PERCENT
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

Particle Size Identification

Boulders	- 8 inch diameter or more	
Cobbles	- 3 to 8 inch diameter	
Gravel	- Coarse	- 1 to 3 inch
	Medium	- ½ to 1 inch
	Fine	- ¼ to ½ inch
Sand	- Coarse	- 2.00mm to ¼ inch (dia. of pencil lead)
	- Medium	- 0.42 to 2:00mm (dia. of broom straw)
	- Fine	- 0.074 to 0.42mm (dia. of human hair)
Silt		- 0.074 to 0.002 mm (cannot see particles)

COHESIVE SOILS

(Clay, Silt and Combinations)

Consistency

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

Plasticity

DEGREE OF PLASTICITY	PLASTICITY INDEX
None to slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to very high	over 22

Classification on logs are made by visual inspection of samples.

Standard Penetration Test — Driving a 2.0" O.D., 1⅜ I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for ATC to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6.0 inches of penetration (Example — 6/8/9). The standard penetration test result N-value is obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.) (ASTM D-1586-67)

Strata Changes — In the Column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (_______) represents an actually observed change, and a dashed line (_ _ _ _) represents an estimated change.

Ground Water observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

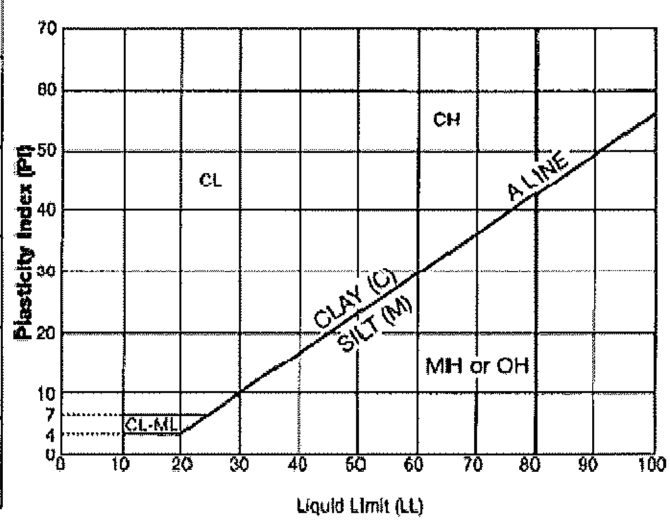
ATC

ENVIRONMENTAL, GEOTECHNICAL AND MATERIALS PROFESSIONALS

Unified Soil Classification System

Major Divisions			Group Symbol	Typical Names	Laboratory Classifications Criteria		
COARSE GRAINED SOILS (More than half of material is larger than No. 200 sieve)	Gravels (More than half of coarse fraction is larger than No. 4 sieve)	Clean gravels	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Determine percentages of sand and gravel from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse grained soils, are classified as follow: Less than 5%........ GW, GP, SW, SP More than 12% ..... GM, GC, SM, SC 5 to 12% .... Borderline cases requiring dual symbols	$C_u = \frac{D_{60}}{D_{10}} > 4 : 1\ C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} < 3$	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.		Not meeting all gradation requirements for GW.	
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.		Atterberg limits below "A" line or P.I. less than 4.	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures.		Atterberg limits above "A" line with P.I. greater than 7.	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve)	Clean sands	SW	Well graded sands, gravelly sands, little or no fines.		$C_u = \frac{D_{60}}{D_{10}} > 6 : 1\ C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} < 3$	
			SP	Poorly graded sands, gravelly sands, little or no fines.		Not meeting all gradation requirements for SW.	
		Sands with fines	SM	Silty sands, sand-silt mixtures.		Atterberg limits below "A" line or P.I. less than 4.	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures.		Atterberg limits above "A" line with P.I. greater than 7.	
FINE GRAINED SOILS (More than half of material is smaller than No. 200 sieve)	Silts and Clays (LL less than 50)		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.			
			OL	Organic silts and organic silty clays of low plasticity.			
	Silts and Clays (LL greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.			
			CH	Inorganic clays of high plasticity, fat clays.			
			OH	Organic clays of medium to high plasticity, organic silts.			
	Highly Organic Soil		Pt	Peat or other highly organic soils.			

1. Plot intersection of PI and LL as determined from Atterberg Limits tests.
2. Points plotted above A line indicate clay soils, those below the A line indicate silt.



Plasticity Chart

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual